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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/758,822 | 01/16/2004 | Vahid Goudarzi | CE11518JGN | 7130 |
| 7590 | 09/21/2005 | | EXAMINER NGUYEN, HOA CAO | |
| Scott M. Garrett Motorola, Inc. Law Department 8000 West Sunrise Boulevard Fort Lauderdale, FL 33322 | | | ART UNIT | PAPER NUMBER |
| | | | 2841 | |

DATE MAILED: 09/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/758,822

Applicant(s)

GOUDARZI, VAHID

Examiner

Hoa C. Nguyen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/16/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "106" and "104" have both been used to designate the same component as can be seen in figures 1 and 2. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

- (a) Page 3, line 13: the "connecters" must be changed to "connectors",
- (b) page 13, line 21: reference characters "1108" must be added after the "fourth copper pad".

Appropriate correction is required.

Claim Objections

3. Claims 3 and 26, 29, 4 and 27, and 7 are objected to because of the following informalities:

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Claims 3 and 26: The term "silver tin and copper" must be rewritten as "silver, tin and copper".

Claim 29: The "according to claim 22" must be changed to "according to claim 24", because claim 29 refers to the "one or more electrical components" which is in claim 24. Furthermore, claims 22, 20, 14, and 13 do not mention the "one or more electrical components".

Claims 4 and 27: The compound "Rosin Mildly Activated Flux" must be changed to "rosin mildly activated flux", because rosin is just a chemical compound.

Claim 7: The "solder past" must be changed to "solder paste".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The limitation that the ratio T/S is at least 0.5, where T is the solder paste thickness and S is the minimum inter-pad spacing, does not particularly point out and distinctly claim the subject matter because of the following:

- (a) If a minimum inter-pad spacing S and an arbitrary T such that T/S is at least 0.5, then solder bridge can be form and it is contradict with the specification as stated on page 2, lines 3-4.

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(b) Just for an example, not even including spread ratio, a solder paste has a thickness of 1 mm and an inter-pad spacing of 0.125 mm, and square pads of 0.125 mm, then a short is formed between pads, while T/S still meets the limitation.

(c) It is known in the art that spread ratio is one of the characteristics of a solder compound. That is the expansion or spread out of a typical solder after heating. The applicant discloses the compounds of the solder, but fails to disclose the spread ratio so that T/S is at least 0.5 still meet the specification such that solder bridge will not be formed.

Appropriate correction is required.

6. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The term "comprises heating the printed wiring board to a temperature above the liquidous temperature for at least 40 seconds" is confusing. Examiner does not know the "liquidous temperature" is referred to the solder paste or something else. Examiner assumed the solder paste.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application

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filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, 3-6, 8-13, 24, and 26-31 are rejected under 35 U.S.C. 102(e) as being anticipated by Tanabe et al. (US 6902102).

Regarding claim 1, Tanabe et al. disclose a printed wiring board (PWB) comprising:

- (a) At least one major surface (reflowing technique), see figures 5, 12, and 17;
- (b) a plurality of copper pads (copper lands) 14 and 171 on the major surface, see figures 12A and 17A, column 8, lines 20-24 and lines 52-57, column 21, line 37, and column 30, line 51;
- (c) a plurality of electronic components 12, 16, 18, and 175 which are inherently including one or more microchips, discrete components, electrical connectors, and EMI shields, see column 21, lines 53-65 and column 31, lines 19-28;
- (d) a plurality of solder joints formed between the copper pads and the electronic components, see figure 12 and column 9, lines 49-59;
- (e) the solder joints comprising a lead-free solder, see column 30, lines 62-64,
- (f) the solder joints are formed by:
 - coating the copper pads with an organic solderability preservative (organic activator for soldering), see column 2, lines 28-34, column 3, lines 59-65, and column 35, lines 25-36,
 - depositing a solder paste 15 and 173 that includes the lead-free solder over the organic solderability preservative, see column 3, lines 59-65, column 18, lines 24-27, column 21, lines 45-58, and column 30, lines 57-59,

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- and heating the PWB in an air atmosphere, see figure 13 and column 21, lines 59-65, column 23, lines 44-52, column 24, lines 3-9, and column 24, lines 61-64.

Regarding claim 3, Tanabe et al. disclose the solder essentially consisting of one or more materials selected from the group including silver, tin, and copper, see column 30, lines 53-54.

Regarding claim 4, Tanabe et al. disclose the solder paste comprises rosin mildly activated flux for use as a flux activator, see column 35, lines 20-24.

Regarding claim 5, Tanabe et al. disclose a solder paste of 1.6 mm thickness, see column 18, line 32 and lines 53-55.

Regarding claim 6, Tanabe et al. disclose every limitation as shown in claims 4 and 5 above and 11 below.

Regarding claims 8 and 9, Tanabe et al. disclose every limitation as shown in claim 1(c) above.

Regarding claim 10, Tanabe et al. disclose every limitation as shown in claim 1(f) above.

Regarding claim 11, Tanabe et al. disclose the solder comprises tin, silver and copper where copper is 0.75% and more than 90% is preferable which is inherently disclosed the limitation of 95.1-95.9% tin and 3.6-4.0% silver, see column 30, lines 62-64.

Regarding claim 12, Tanabe et al. disclose the solder comprises copper and the copper is present in an amount of 0.75%, see column 30, line 54.

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Regarding claim 13, Tanabe et al. disclose a method of manufacturing a PWB comprising;

(a) Manufacturing a PWB that comprises a plurality of copper pads including exposed copper surfaces, as shown in claim 1(b) above;

(b) coating the copper pads with an organic solderability preservative, as shown in claim 1(f) above;

(c) depositing a solder paste that includes a lead-free solder on the organic solderability preservative coated copper pads, as shown in claim 1(e and f) above;

(d) positioning a plurality of circuit components on the PWB, such that contact areas 176 (lead terminal) of the components are in contact with the solder paste 173, see figure 17C and column 31, lines 8-18;

(e) heating the PWB to a temperature above a liquidous temperature of the lead-free solder in an air atmosphere, as shown in claim 1(f) above.

Regarding claim 24, Tanabe et al. disclose every limitation as shown in claims 1 and 13 above.

Regarding claim 26, Tanabe et al. disclose every limitation as shown in claim 3 above.

Regarding claim 27, Tanabe et al. disclose every limitation as shown in claim 4 above.

Regarding claims 28 and 29, Tanabe et al. disclose every limitation as shown in claim 1(c) above.

Regarding claim 30, Tanabe et al. disclose every limitation as shown in claim 11 above.

Regarding claim 31, Tanabe et al. disclose every limitation as shown in claim 12 above.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 2, 14-23, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanabe et al. (US 6902102), where claim 18 is rejected further in view of Kim et al. (US 6479755).

Regarding claims 2, 14, and 25, Tanabe et al. disclose every limitation of the claimed invention, but failed to teach the inter-pad spacing of less than 0.25 mm. It would be obvious to one of ordinary skill in this art at the time of invention to have

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made an inter-pad spacing of less than 0.25 mm for installing electronic components that have lead terminals' spacing of less than 0.25 mm. Furthermore, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routing skill in the art. In re Aller, 105 USPQ 233.

Regarding claims 15 and 16, Tanabe et al. disclose organic solderability preservative for coating of the copper pads to protect the copper from oxidation and as an activator including antioxidant and other additives (conventional activator), see column 19, lines 45-47. It is also noted that organic base solderability preservation is well known in the art for coating copper pad against oxidation before processing of soldering. The group of antioxidant compound containing benzimidazole, benzotriazoles, and imidazole is an organic base antioxidant compound well known for coating copper. It is inherently that the conventional activator includes the substituted benzimidazole, benzotriazoles, and imidazole.

Regarding claim 17, Tanabe et al. disclose the heating the PWB to a temperature above a liquidous temperature of solder for 60 seconds, see column 32, lines 9-13.

Regarding claim 18, Tanabe et al. disclose every limitation but failed the using of non step down stencil; even through, depositing solder paste by using a stencil is well known in the art for reflowing soldering.

(a) Kim et al. disclose a board surface mounting device including a plurality of conductive leads 22 mounted on and electrically connected to a plurality of conductive

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pads 36 and 40 formed on a surface 12 of circuit board 10. The conductive pad is coated with solder deposit 50. The solder deposit is a solder paste and formed by using a stencil. See column 1, lines 24-40 and column 4, line 67 continuing column 5, line 1, and figures 1 and 2.

(b) It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the teaching of Kim et al. on the PWB of Tanabe et al., because stencil is simple and cheap to manufacture and if only one surface is used for mounting electronics components instead of both surfaces as disclosed by Tanabe et al. Furthermore, depending on a typical application, if a uniform soldering is required, a non step down stencil is used; otherwise, and a step down stencil is used if the thickness of solder paste is varied.

Regarding claim 19, Tanabe et al. disclose every limitation as shown in claim 1(c) above.

Regarding claim 20, Tanabe et al. disclose every limitation as shown in claim 3 above.

Regarding claim 21, Tanabe et al. disclose every limitation as shown in claim 4 above.

Regarding claim 22, Tanabe et al. disclose depositing a solder that comprises tin and silver, see column 30, line 55.

Regarding claim 23, Tanabe et al. disclose every limitation as shown in claim 1 above. And the recitation of claim 1 above has not given patentability weight because it has been held that preamble is denied the effect of a limitation where the claim is

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draw to a structure and the portion of the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause. *Kropa v. Robie*, 88 USPQ 478 (CCPA 1951).

Citation of Related Art

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

S. Forney et al. (US PUB 2002/0067486) discloses a solderability assessment.

Cavallotti et al. (US PUB 2004/0020566) discloses a copper preservation treatment.

Nakamura (US 6722028) discloses a method of making electronic device.

Goenka et al. (US 6642485) discloses a system and method for mounting electronic components onto flexible substrates.

Suzuki et al. (US 6695200) discloses a method of producing electronic part with bumps and method of producing electronic part.

Wunderlich et al. (US 6698468) discloses a method for producing solderable and functional surfaces on circuit carriers.

Babb et al. (US 6900383) discloses a board-level EMI shield adheres to and conforms with printed circuit board component and board surfaces.

Teshima et al. (US 6457632) discloses a solder alloy and bonding method of substrate and electric or electronic parts with solder alloy.

Kawaguchi (US 5400221) discloses a printed circuit board mounted with electric elements thereon.

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Yokoyama (US PUB 2003/0081393) discloses a resin-formed substrate and resin-formed substrate unit.

Dalal et al. (US5729896) discloses a method for attaching a flip chip on flexible circuit carrier using chip with metallic cap on solder.

Belopolsky (US PUB 2004/0062015) discloses a surface mounted electrical components.

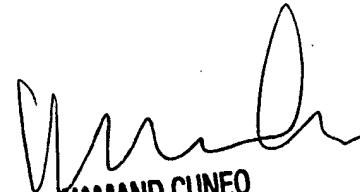
Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoa C. Nguyen whose telephone number is 571-272-8293. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hoa C. Nguyen
31 August 2005


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